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Abstract

Energy has become a new urban public issue in Arab cities and, hence, the trigger of new claims, mobilizations, and even revolts or riots. This article proposes another approach of energy politics. In my view, a set of transformations in energy circuits are directly involved in the 'urbanization' of energy issues. By such a phrase, I mean different processes that reframe and rescale energy issues, usually national and international ones, at the level of the city. Energy reliability and affordability are new claims in the political arena in many Arab cities. Based on earlier research in Tunisia and Jordan, the article examines how policies of electrification in Arab cities have created a new metabolism associated with new power relations, specifically enhancing State legitimacy through symbolical and economical means. But the neoliberal turn in electricity policies, coupled with fossil fuel prices pressures, is undoing this pact. Claims for affordable prices and effective power supply have been fostered in the context of the current uprisings. Grid-embedded resistance practices by ordinary people (customers or workers), which are analyzed in this article, put new light on the vulnerability of urban electricity circuits.

Key words :

electricity; urban metabolism; urban protest; neoliberalism; basic infrastructure

Energy issues are among the usual geopolitical concerns associated with Middle East politics, the oil supply being at the core of the economy of many Arab countries. But the emphasis on the regional and international dimensions of such a problem hides the fact that energy has become a new urban public issue in Arab cities and, hence, this article contends, the trigger of new claims, mobilizations, and even revolts or riots. Some authors have already linked the Arab Spring movements to the transformations in oil politics (Achcar 2013; Mitchell 2011). The peak oil and the subsequent decrease of income from oil would have been a major driver of the Arab revolts because of the resulting destabilisation of the social contract between States and their constituencies, where these States were funding cheap public services and public employment thanks to oil rent. Whatever one can think about this explanation, it can be stated that it makes no room for the spatiality of these movements, and specifically their urban dimension which several studies and this thematic issue are beginning to delve into (Allegra et al. 2013; Verdeil 2011a)

In this article, the aim is to explore another approach of energy politics. In my view, a set of transformations in energy circuits are directly involved in the 'urbanization' of energy issues. By such a phrase, I mean different processes that reframe and rescale energy issues, usually national and international ones, at the level of the city. I am not implying that urban or metropolitan authorities are now becoming key actors in managing energy. Such emerging trends are being observed in several world cities but this is affecting Global Southern cities very marginally (Bulkeley, Castan-Broto, Hodson, et al. 2010; Hodson & Marvin 2010; Rutherford & Coutard 2013). The well recognized lack of autonomy and of financial means of urban and metropolitan governance in Arab Cities (Signoles 2006; United Cities and Local Governements 2008) makes the existence of such urban or metropolitan energy policies very unlikely. Nevertheless, Arab cities rely increasingly, like elsewhere, upon complex energy infrastructures and experiment a growing demand for energy, stirred by State policies of electrification, increasing demographics and new middle class habits specifically found in urban areas. Such an 'interaction between urban change and the transformation of [the energy system] can be labeled as an urban energy transition' (Rutherford & Coutard 2013, p.3). At the same time, the energy stress caused by rising hydrocarbons prices and peak oil threats has placed claims for energy reliability and affordability in the political arena in many Arab cities. The urbanization of energy issues is then both material and political. Such claims have gained momentum with other political mobilizations and have fueled the current Arab revolts.

In order to deepen the hypothesis of an 'urbanization' of energy issues, this article attempts to understand energy transitions as political processes embedded in the materiality of energy circuits. It highlighs the intersection of such circuits with the urban, conceived of as a site of metabolic relationships where political struggle for the use of energy takes place. To fit with the requested size of the article, I present an overview on findings from on-going research in Jordan and Tunisia in recent years. Further details about field methodology and empirical findings are to found in the following references (Verdeil 2011b; Verdeil 2013a; Bennasr & Verdeil forthcoming).

Energy transition and urban metabolism: the case of electricity

Far being technical and managerial processes, energy transitions are widely recognized as political and contested processes (Rutherford & Coutard 2013; Bulkeley, Castan-Broto & Maassen 2010; Hodson & Marvin 2010). By examining successively the transition from biomass to coal and then from coal to oil, Timothy Mitchell's book on *Carbon Democracy* has provided a inspiring account that

links this political dimension to the particular materiality of energy circuits (Mitchell 2011). This linkage is fruitful for the purpose of this article. He defines his approach as to 'follow closely a set of connections that were engineered over the course of a century between carbon fuels and certain kinds of democratic and undemocratic politics' (p.252). He states that 'exploring the properties of oil, the networks along which it flowed, and the connections established between the flows of energy, finance and other objects provides a way to understand how the relations between these various elements and forces were constructed. The relations connected energy and politics, materials and ideas, humans and nonhumans, calculations and the objects of calculation, representations and forms of violence, the present and the future' (p.253).

The mapping of these circuits allows for identifying the spatial and physical components of the networks as well as understanding the political and contested nature of the connections through which rests the continued circulation of energy at different points of the networks. A fundamental point of Mitchell's analysis is the unraveling of the vulnerability associated to these connections. This vulnerability is to be understood as socially constructed and inherently political. Mitchell offers rich insights about the political struggles over the control of the strategic nodes of the energy circuits. Oil geopolitics has rest, for a century, on fragile, risky, shifting and vulnerable alliances of transnational firms, the British and US governments, and the local elites during the twentieth century.

Mitchell shows that the vulnerability must not only be conceived at the level of national or geopolitical alliances, but also thought in relationship with the very nature of different forms of energy and the material organization of the networks through which it flows. The successful fights by the worker unions in coal mining and transportation to impose democratic and social rights in Western Europe from the end of the 19th century until the 1940's owed much to the spatial concentration of the production and transportation of coal. Indeed, the material nature of coal (a very heavy ore), whose transportation was dependent upon human work in the mines, transportation on canals, or railways from the mines to the places of consumption, gave power to the workers in these sectors to block these flows until their claims were accepted.

That example highlights the power of the energy workers and hence, the relevance of social struggles in addition to geopolitics in understanding the political vulnerability of energy circuits. But the customers also have their say in these struggles for energy, as shown by the politics of electricity meters in Nicaragua (Cupples 2011). The privatization of power distribution there has prompted customers' mobilizations against price hikes. Specifically, as will be underlined in this article, demonstrations and political campaigning as well as meter tampering are different illustrations of the power of end-users in disrupting energy circuits. Examining the political struggles that shape energy circuits thus implies taking into consideration not only the traditional big players (governments, transnational companies and national utilities) but also the sector's workers and their unions, as well as the customers, their practices of consumption and their representations of energy as a right.

Examining the materiality of energy circuits and the particularly vulnerable connections nodes in them allows for identifying sites for politics, where the governance of energy system might be challenged. But despite Mitchell's interest in the material properties of energy, place and the urban have almost no role in his framework.

I am here conceiving of the urban as constituted of a set of metabolic relationships hybridizing nature and society. Following Swyngedouw, 'we wish to see the city as a metabolic circulatory

process that materializes as an implosion of socio-natural and socio-technical relations organized through socially articulated networks and conduits whose origin, movement, and position is articulated through complex political, social, economic, and cultural relations. These relations are invariably infused with myriad configurations of power that saturate material practices, symbolic ordering, and imaginary (or imagined) visions.' (Swyngedouw, 2006). Rethinking the energy flows into and throughout the cities as urban metabolism (Heynen et al. 2006) allows to unravel their political nature and hence, to reconnect them with social movements in the city (Swyngedouw 2011). The circuits of energy are a good illustration of such 'socially articulated networks and conduits' through which natural phenomena like oil, water force, or wind speed, etc. are transformed and hybridized into new material and symbolical forms – all along with other 'natural' products like water, concrete, iron, asphalt, etc. and social forces – human work, money – to produce urban landscapes.

At this stage, it must be stated that the empirical study cannot keep on speaking about energy, as an abstraction. In order to analyse the intersection of energy flows and the urban, it's necessary to specify which form of energy it will deal with, since only unraveling the material properties enable to address the concrete assemblage of power which are at stake. It is common to imagine the modern city as the city of oil, with its reliance on car, its networks of highways and clover-leaf interchanges, or on another register, the high-rise headquarters of petroleum companies (Hein 2010). Such a view is of course particularly relevant for Arab cities, which sometimes were literally born out of the oil fields (Fuccaro 2013). Nevertheless, in this article, I choose to insist more on the link between electricity and city. Historians have well documented how electricity has shaped the modern city, with its illuminated high-rise buildings served by electrically powered lifts and cooled thanks to electrically produced conditioned air, tramways and subways for transportation, luminous advertisings and general stores or the spreading of electrical devices at home (Platt 1991). Thus, the rise of the 'electric city' is par excellence an energy transition which is associated with a considerable change in the urban landscape as well as in the way of life and the configurations of power relations. Paying attention to electricity allows us to finely analyse energy flows and socio-political changes not only at the scale of the city but also at the level of the building and even the home.

In the next section, I will expose a few trends showcasing how the recent but almost complete electrification of Arab cities has transformed both the everyday practices of the urbanites and their urban imagination while it has reinforced the symbolical reordering of the social hierarchy in the city. But those metabolic changes, in turn, open new vulnerabilities. The following section deals with the energy stress encountered by urbanites in recent years, in the form of electricity shortages and price hikes, thus making challenging the political assemblages and triggering claims against the regimes in Egypt, Jordan and Tunisia. The last section highlights the specific intersections of electricity circuits and marginalized urban sites, and unravels various tactics of resistance to energy policies threatening people's way of life. The combination of both represents a major factor of unrest in Arab cities nowadays.

The transition to electricity in Arab cities and the affirmation of State

In the cities of the Arab world, electrification began in the 1920's-1930's and was boosted after the independences, in a trend that accelerated in the 1970' to deliver its fruits in the 1990's with universalization of electricity in Arab cities. This was the result of significant the State-led efforts,

since electricity symbolized the promises of development. It also deeply transformed the material practices and way of life of urbanites.

According to the International Energy Agency, in 2009 the electrification level in North African cities was 99.6% and 98.6% in the Middle Eastern ones. Indicators for the electrified population at the urban level are not provided by international data bases but since almost everywhere the urban population exceeds the half and even in many cases, 70% of the total population, national level data show that apart from specific cases like Yemen or post-war Iraq, most countries have almost reached total urban electrification.

Table 1: Electricity access in the Arab world

	Electrification level (%) 2002	**Electrification level (%) 2009**	**Population without electricity** millions (2009)	**Urban Population 2009 (%)**
Algeria	99	99		71
Bahrain	100	99,4	0,0	89,0
Egypt	98	99,0		43,0
Iran	99	98,4	1,2	69,0
Iraq	95	86,0	4,1	67,0
Israel	100	99,7	0,0	92,0
Jordan	95	99,9	0,0	82,0
Kuwait	100	100,0	0,0	98,0
Lebanon	96	99,9	0,0	87,0
Lybia	100	?		77,0
Morocco	77	97,0		56,0
Oman	95	98,0	0,1	73,0
Qatar	96	98,7	0,0	98,0
Saudi Arabia	98	99,0	0,3	82,0
Syria	87	92,7	1,5	55,0
United Arab Emirates	97	100,0	0,0	84,0
Tunisia	95	99,0		66,0
Yemen	50	39,6	14,2	31,0

Source: IEA, World Energy Outlook 2005, 2011 ; Urban Population from the World Bank

Since historical records for electrification are sparse, a few examples better suggest the recent changes that have happened. In Jordan, national and urban electrification levels amounted to 71.5% and 78% in 1979, in Tunisia in 1975 respectively 34.2% and 68.2[1]. In every case, they have now reached 97-100% at the national level, the cities being fully connected. In this respect, Arab cities are distinct from Sub-Saharan African cities or other poor countries like India (Heuraux 2010). Their trajectories make them look like more industrialized countries even though their level of industrialization is low.

The universalization of electricity in cities cannot be understood apart from the strong involvement of states in that sector. The of Tunisia and Jordan showcase the tight intertwining of electrification

[1] National statistical records.

and state-building, where the quest for legitimacy was a struggle of independence against the former metropolis, and also destined to counter internal contestation.

In Tunisia, STEG (Société tunisienne d'électricité et de gaz) was created in 1962 as a public company in charge of the production and distribution of electricity and the distribution of gas. It replaced a set of French private companies that operated fragmented, inefficient, and socially exclusive electricity grids in Tunisian biggest cities during the Protectorate. STEG was in charge of expanding the network into the cities and into the countryside. After the launching of a national strategy aiming at rehabilitating informal settlements in the 1980's, STEG – with other public infrastructure companies – became an arm of the State devoted to the social regulation of these neighborhoods, with the double objective to calm down social and political protests by the unions and the left, and then by the islamist movements, and therefore to legitimise president Ben Ali, who took power in 1987 (Chabbi 1999). This policy proved successful with connection rates nearing 100% in the end of the 2000's.

The Jordanian case features similar State commitment towards cities electrification. Private initiatives have also been at the origin of the electricity network in Amman[2] and, in association with the municipality, in Irbid, the second largest city. During the 1960's the State nationalized the generation sector, and parts of the distribution one (except in Amman), and built a national network, which it then extended toward the countryside. Meanwhile, and specifically after the Black September event in 1970, the Palestinian camps and the informal settlements in major cities were upgraded and progressively connected to the electricity grid (Ababsa 2013 sur Amman). During this period ranging from the 1970's and the 1990's, Amman and Irbid experienced a very strong demographic increase, partly due to waves of migrations from the Arabic Gulf, but the State managed to follow the pace with infrastructural achievements, specifically in the electricity sector as statistical records quoted above illustrate. Concerns for security and search for political legitimacy have prompted the Jordanian government to devise a policy that presents many parallels with the Tunisian case, except that the nationalization carried out under the auspices of the Jordan Electricity Authority allowed the existing private distribution companies to remain operating.

This universalization of access to electricity has a direct impact on daily practices, as shown by the generalization of electrical appliances. Fridges and TV's are to be found in 95 and 96% of households in Jordan in 2010 and in 90 and 95% in urban Tunisian households in 2004. Such uses probably have impacts on the social roles within the household but lack of research prevents from drawing conclusions. A spectacular and recent new practice is the spreading of air conditioning, estimated at 15% of households in Tunisia, but 30% in big cities, which indicates changing perceptions of the body (Shove et al. 2013). Electricity has reconfigured the standards of living and the social relationships, from the level of the body to the whole city (street lighting, work places, etc.).

The new material practices and uses of electricity are strongly articulated with a symbolical (re)ordering, through which social hierarchies are reaffirmed. The development of shopping malls, heavily illuminated and cooled thanks to electricity, has become the symbol of a new era of consumption fetishizing imported commodities. Such places, that are mainly found in upscale districts, attract people of various origins, many of which can only desire the products, but not consume them (Pages-El Karoui 2012; Schwedler 2010). In the light and in the coolness, social

[2] See a recent account: "A merchant's tale recalls Amman electric revolution" (Freij 2012).

hierarchies are reasserted. Conversely, in many informal areas, the struggle for regularization is also a fight for light, not only in the home, but also for street lighting, which places a neighborhood in the night map and promises security for the people. Remaining in the dark nowadays means remaining outside the city (Verdeil 2013b).

The electrification of Arab cities since the independence period has fostered a new metabolism through which the urban has been radically transformed, both materially, symbolically and politically. The wired city is materially reshaped, the way of life remade through the wide use of domestic and office appliances, while the light and other electrical devices have transformed its perception. A specificity of Arab cities regarding electricity probably resides in the way this flow of energy has helped building the legitimacy and the political power of the State, the main supplier of this service, in exchange of providing electrical service at cheap rates. These facts are clearly in line with Marvin and Graham's observation about new independent countries, that "The expansion of infrastructure networks began to be seen as the material representation of modernization and the assertion of an embryonic national identity in the form of airports, four-lane highways and power stations that would sweep away the divisions of colonialism and the barriers of traditionalism"(Graham & Marvin 2001) p.84). Yet, this new imagination of the luminous city and its entanglement with state-building went along with the symbolical and material reassertion of social hierarchies in the city, as shown by unequal lighting of impoverished areas. This social pact has come under threat in recent years.

Neoliberalization of the Electricity Sector, Changing Role of the State, and Urban Revolts

From the 1990's and in the 2000's, the electricity sector has been increasingly transformed by neoliberal policies, while pressures on hydrocarbon fuel supply (both geological and geopolitical) changed the economic terms of electricity generation. Neoliberal policies regarding the electricity sector have been promoted by international funding agencies, like the World Bank, and the local ruling class, as part of a more global package of Structural Adjustment Policies. Such policies involved the unbundling of state-utilities, their privatization and the commodification of electricity, i.e. the removal of subsidies on tariff (Harvey 2005; Graham & Marvin 2001). Aside from the usual concern for 'waste of public funds', the claim for removing subsidies found another justification in the new context of fuel supply. Whereas new energy-consuming practices prompted a surge in electricity demand, the hydrocarbon market has experienced a strong increase in prices since 2003, because of rising international demand and low rising or even stagnation of hydrocarbon production (Mason & Mor 2009). The geopolitical struggle in the Middle East, with the consequences of the Iraq war, also added to those pressures (Mitchell 2011). The implementation of these policies has threatened the new ways of life as well as the symbolical inclusion in the urban modernity electrification had spurred. Therefore, these policies have been met with discontent and increasing contestation, while the State was marred with allegations of corruption – touching among other the electricity sector. The social pacts between the state and the people were then weakened, while the electrified way of life and the aspiration to it were threatened, prompting concerns for continued affordable access to electricity. The ongoing revolts and revolutions in Jordan and Tunisia offer insights in this electricity anger.

During the 1990's, under the pressure of international money lenders and with the implementation of the Structural Adjustment Policy, the Tunisian government authorized a first Independent Power

Producer to operate a new power plant that went to the grid in 2000 and now generates about 25% of Tunisian electricity. Meanwhile, STEG's strategy became defined through 'contractualisation' with the State, which led to the adoption of market-oriented management tools aiming at increasing its efficiency, containing the growth of its manpower and targeting the end of tariff subsidies (Ben Letaïef 1998). This policy was justified by the increasing energy dependency of Tunisia, whose own hydrocarbon resource do not meet the domestic demand anymore.

These changes and specifically the rise in tariff implemented in the late 2000's, has changed the image of STEG in the population. While it embodied national pride and modernity, STEG became associated with opaque billing practices and unfair advantages for its employees who receive free electricity. A specific claim dealt with the television tax that is paid through the electricity bill[3]. Moreover, corruption benefiting relatives of the former President have marred several projects contracted by STEG. If these claims were not at the heart of the claims that led to the Tunisian Revolution, they nevertheless played their role in the people's discontent and are nurturing its course since January 2011, along with other claims more generally related to public services and essential goods (Bennasr & Verdeil forthcoming).

The Jordanian case features similar changes. Pressures toward privatization proved even stronger than in Tunisia and led in the end of the 1990's to a reshuffling of the electricity sector which was unbundled. In 2007, the State sold the majority of its participation in the generation and distribution sectors, and authorized foreign firms to operate new power plants needed to accommodate the sharp rise in power demand. Meanwhile, Jordan structural dependency upon oil and gas imports has been heightened by regional geopolitics: the invasion of Iraq, which ended the cheap supply from this country in 2003 (Mason et al. 2009); and the Egyptian revolution which resulted, for complex reasons, in a disruption in natural gas delivery from this country. Both factors have led to considerable increases in the cost of electricity, and hence, in the burden of public subsidies needed to compensate the electricity tariff (Verdeil 2013a).

The successive Jordanian governments have been striving, since 2008, to review the tariff in order to cut the rising public debt. Three rises have been implemented but they remained lower than expected, because of major demonstrations and strong lobbying by powerful groups like merchants, industrialists and hospitals unions. Combined with the demonstrations against the rise of the price in other basic goods, as well as with denunciations of corruption[4], and in the context of the Arab revolts in several countries, including neighboring Syria, such a movement has shaken the successive governments and even the regime, since calls for a constitutional monarchy have been voiced (Moore 2012).

Uncontrolled movements on the oil market as well as the breaches of the social pact between the State and the population, about a service that is at the heart of the city's way of life, have opened up new vulnerabilities in the financial and political circuits of electricity. The increasing power cuts

[3] Bougoutayya I., Facturation STEG - Les raisons d'une facturation salée -, *Le Quotidien*, 2/4/2011.

[4] Strikingly, the first demonstration in March 2011 led to the resigning of Prime minister Samir al-Rifai , who had been directly involved in the designing of the privatization policy as an adviser of the king, before becoming the CEO of a Jordanian-Emirati company who bought the majority of two former electricity state-utilities, and being lastly nominated as Prime minister in 2009.

affecting Tunisian and Jordanian cities recently offer a material illustration of it, while street protests about tariff also illustrate the high sensitivity of urban population to energy – and specifically electricity - in the context of the Arab Spring[5]. A mostly urban concern is becoming a public issue contested in the public space. In the last section of the article, the unraveling of the practices of resistance to the reforms of the sector helps understand the disruptive potential of mobilizations related to urban electricity circuits.

The vulnerability of urban electricity circuits

Indeed, the dissatisfaction revolving around electricity and the way it became a part of the protests highlight the technical-political vulnerability of urban electricity circuits and illustrate the people's agency in resisting to the above mentioned change of the State's role. Here, I want to shed light on a specific segment of the electricity network: the end of lines, where utilities employees and of customers assert their power.

The end of lines is the location of connections between the utility networks, the customers and the utilities workers. In these areas, the electric power is transformed from high/middle into low voltage. The stations are physically located within the neighbourhoods and though entering them can be dangerous, they are easier to access than other parts of the networks. Similarly, after the transformers, the power flows through low voltage lines, which skilled people can relatively easily hook-up (Zaki 2011). The connection also materialises through the electricity meter, which itself can be targeted and tampered with in various ways. In case of conflicts between the utility and the customers about the tariff, the schedule of delivery, the conditions of connection, all these points of the network can be seized and bypassed in ways that highlight the power of customers and end-line users who enjoy their physical proximity to the line in remote places where the dwellers, linked by solidarity links, can defend themselves against utility workers intervention against hook-ups and tampering. Such strategies, described and conceptualized in Nicaragua (Cupples 2011), are to be found in many places. In recent years, the managers of several Jordanian utilities have reported, for instance, a rise in "non-technical losses" which is the coded phrase for theft, hook-ups and tampering[6]. This is happening in a context of tariff hikes not only for electricity but also for the gas canisters used for heating. In winter, people resort to individual electrical heaters whose consumption is very high and therefore add to their invoices. But facing electricity rates hikes, they also shift to less expensive fuels, sometimes through illegal means. Hajjaj's cartoon ironically emphasizes the agency of Jordanian people coping with energy challenges (figure 1).

Figure 1: The struggle for home heating in Jordan

[5] Unusual and strongly felt power cuts took place in Tunisia and Jordan during the summer 2012 (Namrouqa 2012; La Presse de Tunisie 2012). The same goes about Egypt, where people have to cope with shortages of electricity, and natural gas delivery (Markoum Verdeil 2013).
[6] Fieldwork interviews in Amman and Irbid, 2008-2010.

The cartoon displays the “mourabahaniah” stove, which allows the customer to avoid any fuel shortage. The legend says : “Out of stock today ! With the “mourabahaniah” stove specifically designed to cope with the Jordanian winter. It burns all available fuels from free markets” (©Emad Hajjaj, 2012)

The connection between the network and the customer isn’t solely a physical device: it is also the collector that goes to the streets, reads the index and distributes the bill to the customer. Here again, the customer can display his power by refusing to pay in due time. In so doing, he exposes himself to the possibility of being cut off. But such a move can only be achieved with a team of utility workers coming to the field to physically disconnect the line, where they risk being resisted or assaulted. In Tunisia, non-payment, which already existed, has jumped to unusual levels after the revolution. In certain neighbourhoods, more than one third of customers did not pay their dues. 204 cases of assaults against STEG’s workers have been recorded since the revolution[7]. The government and the utility were forced to soften their usual way of fighting what they call ’uncivic’ behaviours. They gave more time to customers in arrears to pay their delayed bills while reducing the usual fines and publicly stating they wouldn’t disconnect them, and wouldn’t charge the (heavy) reconnection fees which are usually applied[8]. Nevertheless, these behaviours have persisted, highlighting the power of

[7] Tuniscope, 2013. 204 cas d’agressions contre les employés de la STEG recensés depuis la Révolution. *Tuniscope.com*. Available at: http://www.tuniscope.com/index.php/article/31892/actualites/societe/steg-revolution-413712 [Consulté le septembre 25, 2013].

[8] Debbar Z., 2011, La STEG ouvre une nouvelle page, *Echo Journal*, 1 avril 2011.

the customers. In 2011, the unpaid sums amounted to 368 million DT of which 183 from the residential and small professional users like merchants, informal workers, etc. From 2011 to 2012, the deficit of the STEG rose from 303 million DT to 407 million[9].

The workers in the electricity distribution sector also have power that comes from their function in maintaining the wires and collecting the bills, thus making the reverse circulation of electricity and of money in the circuits – an infrastructure which has a material but also a financial nature. In Tunisia, in the above mentioned events, the electricity union made claims that 'uncivic' behaviours and aggressions endangered the workers and should stop. The union strongly argued that during the revolution, its workers never ceased maintaining the infrastructure. Implicitly, it pointed out that continuous threatening of the workers could lead to intervention refusal, thus pressing both the customers and the managers to take measures that would help cool the tension – which was indeed implemented. In so doing, the union recalled its own power in the sustaining of the grid.

In Jordan, in April 2012, a similar strategy was successfully implemented by JEPCO's workers, the electric utility in Amman[10], as they went into strike to defend their benefits. A specific aspect of their strike was to retain the money collected from the customers, causing a loss in income for the company and therefore forcing her to come to the negotiation table. This highlights again the power of end-line workers.

In ways similar to Timothy Mitchell's demonstration of the power of coal workers and their ability to fight for their democratic rights, these different examples show how the physical and political configuration of the network creates various forms of vulnerability in which a range of end-line users (workers or customers) can assert their power in order to advance social rights. Periods of massive protests like those experienced in Arab cities create momentum for such struggles but conversely, outrage can also be stirred by the lack of, or rising prices, of fuel.

Conclusion

This article has made the argument that energy politics is of the greatest significance to understand the current revolts in Arab cities. Going away from traditional account on rentierism and oil geopolitics, it is suggested here that understanding the urban material politics and experience of energy is a necessary step that is missing in national or regional level analyses. It means reintroducing space, the materiality of the urban and the complex and shifting networks of social and political relations that constitutes it and to unravel its entanglements in the shifts urban energy system are undergoing. In so doing, the article has connected Mitchell's call for following the energy circuits, conceptualized as complex assemblages of material and discursive, human and non-human elements, highly subjected to political vulnerability at the connection points of circuits, with Swyngedouw's proposal to read cities as metabolic processes infused by configuration of power.

[9] Kapitalis, 2011, Tunisie. Les impayés de la Steg s'élèvent à 213 millions de dinars, *Turess*, 17 août 2011, < http://www.turess.com/fr/kapitalis/5447 > ; Youssef B., 2012, Plus de 360 millions de dinars d'impayés pour la STEG, *Tunisie Numérique*, 13 janvier 2012, < http://www.tunisienumerique.com/plus-de-360-millions-de-dinars-d%E2%80%99impayes-pour-la-steg/95701 >.

[10] Electricity workers end strike as union reaches deal with company, *The Jordan Times*, 23 april 2012 < http://jordantimes.com/electricity-workers-end-strike-as-union-reaches-deal-with-company >

Reviewing recent material, economic and political transformations of energy issues in Arab cities, this article has shown, by focusing on electricity, that a massive urban energy transition had taken place. Electricity nowadays has become an indispensable form of energy in cities, which shape urban landscapes and urban way of life. Electricity also spurred a new symbolical order, highlighting the role of the State as a broker of urban modernity, thanks to the engineering of subsidies. But the recent liberalisation of electricity tariff and, more broadly, the changing symbolical and political relationships between the State and the urban citizens, triggered strong mobilizations that converged with the current Arab revolts. The complex connections between the electricity grid and the urban also offer diverse agents – dwellers, utility workers – the opportunity to exploit their position in the circuit to resist such policies.

While the energy transition toward low carbon energy is seen as a new and strong imperative in a context of sustainable urban development and of oil peak, the current mobilizations point to the social challenges such policies would face. Not only would this involve a dramatic economic and financial reshuffling of the massive public subsidies, but also hurt habits and representations embedded in the urban circuits of energy (and electricity). The current revolts have shown the ability of various actors in these circuits to use the vulnerabilities of the circuits – and first the financial weaknesses of the electric utilities – to resist reforms hurting their rights to affordable energy, which is synonymous with the right to the city.

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